

Stock assessment and restoration of the Afognak Lake sockeye salmon run

Abstract: Afognak Lake sockeye salmon *Oncorhynchus nerka* runs declined substantially in 2001 and subsequent escapements from 2002-2004 have been well below the escapement goal. Responding to concerns from local subsistence users, the Alaska Department of Fish and Game began investigations of the lake's rearing environment. With successful completion of a one year mark-recapture feasibility study to estimate smolt abundance in 2003, a three-year study (2004-2006) to continue the smolt abundance estimates and assess rearing and spawning habitats was funded. During 2004, 67,528 sockeye salmon smolt were captured using a Canadian fan trap operated from 11 May to 3 July. Using mark-recapture techniques, we estimated that 430,004 sockeye salmon smolt (95% C.I. 371,905 - 488,104) emigrated from Afognak Lake. The population was composed of 387,584 age-1. and 42,420 age-2. smolt. Age-1. smolt had a mean weight of 3.6 g, a mean length of 75.7 mm, and a mean condition factor of 0.80. Age-2. smolt had a mean weight of 3.6 g, a mean length of 78.7 mm, and a mean condition factor of 0.74. Five limnology surveys were conducted at two stations in Afognak Lake from May to September, 2004. Seasonal water chemistry and nutrients concentrations were consistent with historical data collected from Afognak Lake. Afognak Lake is considered phosphorus limited. Seasonal zooplankton density averaged 104,291 animals per m², and cladocerans comprised 54.6% of the zooplankton sampled. The cladoceran *Bosmina* was the most abundant zooplankter, while *Epischura* was the most abundant copepod. Rearing conditions within Afognak Lake appear to be stable or improving since lake's water chemistry and nutrients were similar to historic levels and zooplankton abundance did not suggest overgrazing. Favorable rearing conditions were also reflected in the relatively high condition factor of the smolt (>0.70) that enabled most of them to emigrate at age-1.

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